4.1 Estimating Roots

MATH LAB

LESSON FOCUS Explore decimal representations of different roots of numbers.

Make Connections

Since $3^2 = 9$, 3 is a square root of 9.

We write: $3 = \sqrt{9}$

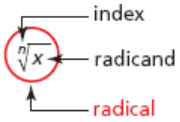
Since $3^3 = 27$, 3 is the cube root of 27.

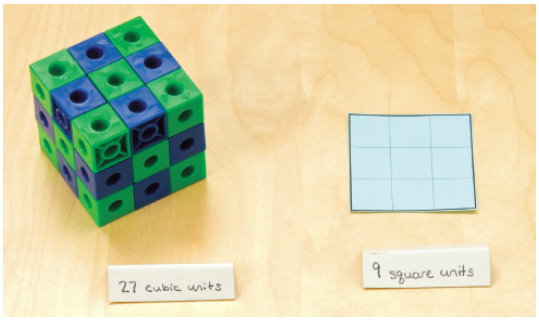
We write: $3 = \sqrt[3]{27}$

Since $3^4 = 81$, 3 is a fourth root of 81.

We write: $3 = \sqrt[4]{81}$

How would you write 5 as a square root? A cube root? A fourth root?





Please copy down and try these:

Estimate the square root of 8

$\sqrt{8}$ = 2.75

$2 \times 2 = 4$ | $3 \times 3 = 9$

2.5 | 3

Estimate the cubed root of 28

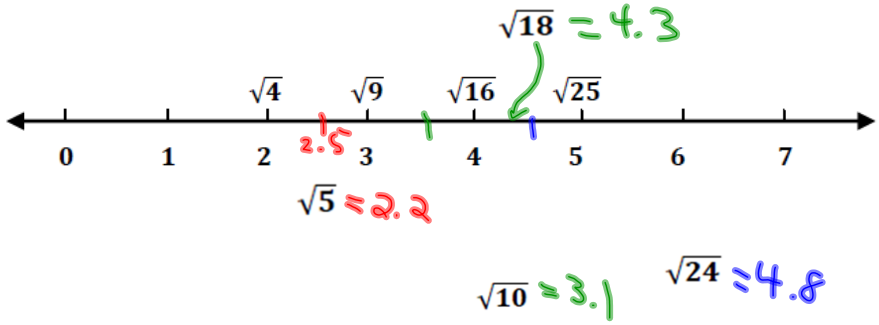
Wednesday, September 21st

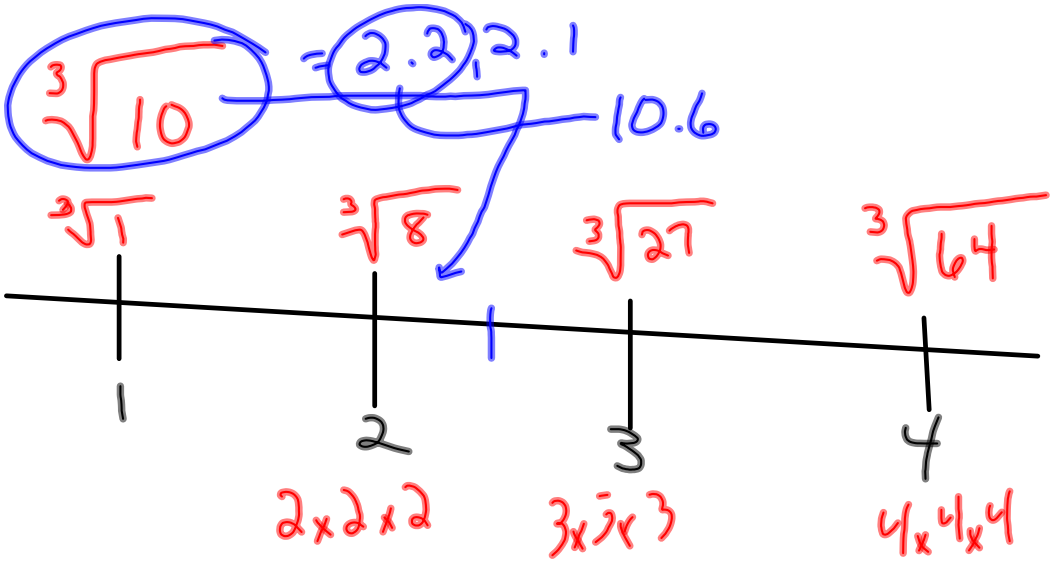
- Review estimating square roots and cubed roots
- Practice questions
- Begin Section 4.2 Irrational numbers
- Practice questions

Estimating Square Roots

- When you are trying to find the square root of a number that is not a perfect square you need to estimate your answer using benchmarks.
- Benchmarks, in this case, are the perfect squares and their square roots.
- The goal is to determine which two perfect squares are on either side of the number that we are taking the square root of.

Where should we place the following values?





TRY THIS

Write the two consecutive perfect squares closest to 20.

Fill in the table until the square of the estimate is within 1 decimal place of 20.

Estimated value of $\sqrt{20}$	Square of estimate
$\sqrt{16}$	4
$\sqrt{25}$	5
$\sqrt{20}$	< 4.5
$\sqrt{20}$	4.4

4.1 Math Lab: Estimating Roots

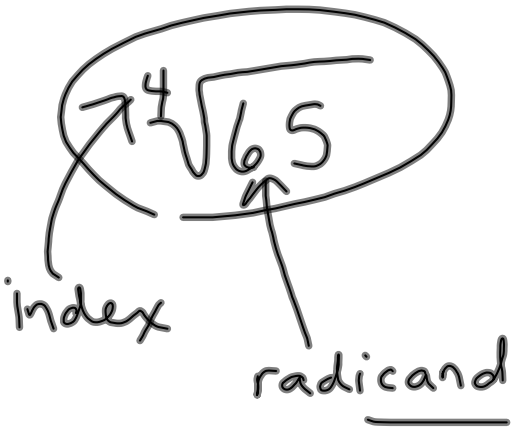
TRY THIS

Write the two consecutive perfect cubes closest to 20.

Fill in the table until the cube of the estimate is within 1 decimal place of 20.

Estimated value of $\sqrt[3]{20}$	Cube of estimate
$\sqrt[3]{8}$ =	2
$\sqrt[3]{27}$ =	3
$\sqrt[3]{20}$ =	> 2.5
$\sqrt[3]{20}$ =	2.8, 2.7 ✓
	2.7 x 2.7 x 2.7 = 19.6

4.1 Math Lab: Estimating Roots



$\sqrt{8}$

$2 \times 2 \times 2 \times 2$

$\sqrt[4]{16} = 2$

$\sqrt[5]{?} = 2$ $\quad \sqrt[5]{32} = 2$

32

$2 \times 2 \times 2 \times 2 \times 2$

TRY THIS

Write the two consecutive perfect fourth powers closest to 20.

Fill in the table until the fourth power of the estimate is within 1 decimal place of 20.

Estimated value of $\sqrt[4]{20}$	Fourth power of estimate

4.1 Math Lab: Estimating Roots

TRY THIS

Determine the value of each radical.

Radical	Value	Is the Value Exact or Approximate?
$\sqrt{16}$	4	Exact
$\sqrt{27}$	5.1962	Approximate
$\sqrt{\frac{16}{18}}$	$\frac{4}{9}$ or $0.\overline{4}$	Exact
$\sqrt{0.64}$		
$\sqrt[3]{16}$		
$\sqrt[3]{27}$		
$\sqrt[3]{\frac{16}{18}}$		

4.1 Math Lab: Estimating Roots

TRY THIS

Determine the value of each radical.

Radical	Value	Is the Value Exact or Approximate?
$\sqrt[3]{0.64}$		
$\sqrt[3]{-0.64}$		
$\sqrt[4]{16}$		
$\sqrt[4]{27}$		
$\sqrt[4]{\frac{16}{18}}$		
$\sqrt[4]{0.64}$		

4.1 Math Lab: Estimating Roots

TRY THIS

Choose 3 different radicals. Complete the table for these radicals.

Radical	Value	Is the Value Exact or Approximate?

TRY THIS

How can you tell if the value of a radical is a rational number?
What strategies can you use to determine the value of the radical?

How can you tell if the value of a radical is *not* a rational number?
What strategies can you use to estimate the value of the radical?

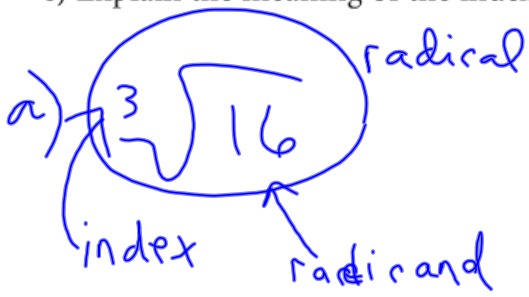
Thursday, September 22nd

- Check and go over homework questions (Pg.206)
- Warm-up #3
- Begin Section 4.2 Irrational numbers
- Number Terminology Chart

Classwork/Homework

Page 206 #1, 2abe, 3abe, 5abc, 6

1. **a)** Give 4 examples of radicals. Use a different index for each radical.
b) Identify the radicand and index for each radical.
c) Explain the meaning of the index of each radical.



c) cubed root of 16

2. Evaluate each radical. Justify your answer.

a) $\sqrt{36}$ **b)** $\sqrt[3]{8}$ **c)** $\sqrt[4]{10\,000}$ **d)** $\sqrt[5]{-32}$

e) $\sqrt[3]{\frac{27}{125}}$ **f)** $\sqrt{2.25}$ **g)** $\sqrt[3]{0.125}$ **h)** $\sqrt[4]{625}$

a) 6

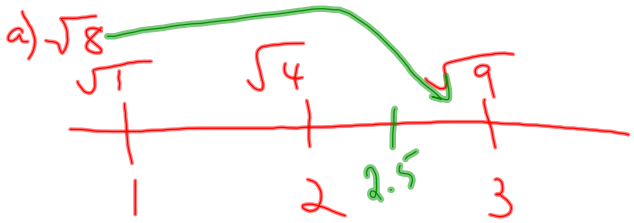
b) $\sqrt[3]{8} = 2$

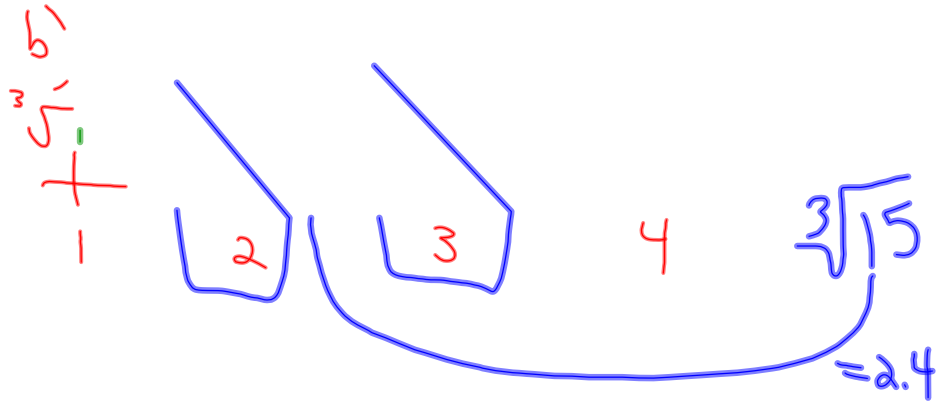
c) $\sqrt[3]{\frac{27}{125}} = \frac{3}{5}$

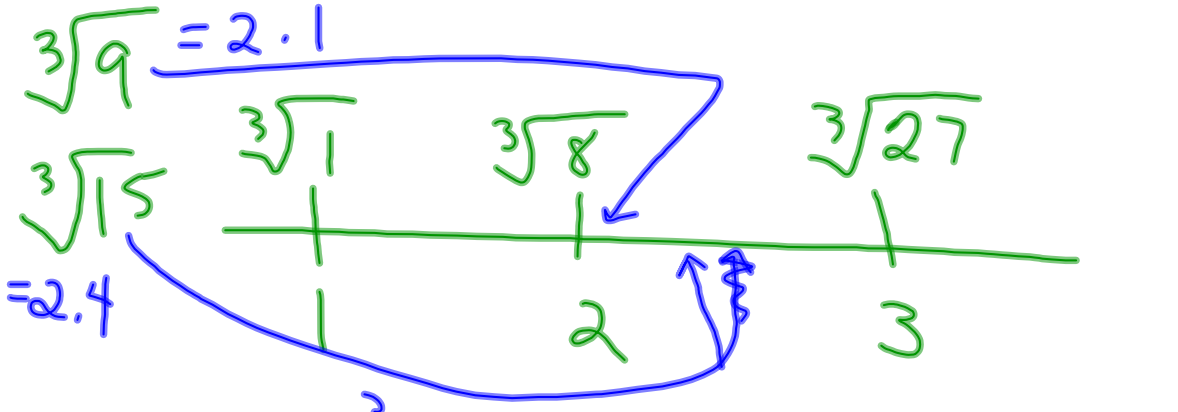
3. Estimate the value of each radical to 1 decimal place. What strategy did you use?

a) $\sqrt{8}$ **b)** $\sqrt[3]{9}$ **c)** $\sqrt[4]{10}$ **d)** $\sqrt{13}$
e) $\sqrt[3]{15}$ **f)** $\sqrt[4]{17}$ **g)** $\sqrt{19}$ **h)** $\sqrt[3]{20}$

a) $\sqrt{8} = 2.8$







$2.1^3 = 2.1 \times 2.1 \times 2.1 = 9.261$

5. For each number below, write an equivalent form as:

i) a square root **ii)** a cube root ~~**iii)** a fourth root~~

a) 2 **b)** 3 **c)** 4 **d)** 10 **e)** 0.9 **f)** 0.2

$\sqrt[3]{.008} = 0.2$

a) 2 i) $\sqrt{4} = 2$ ii) $\sqrt[3]{8} = 2$

b) 3 i) $\sqrt{9} = 3$ ii) $\sqrt[3]{27} = 3$

c) 4 $\sqrt{16} = 4$ $\sqrt[3]{64} = 4$

6. Choose values of n and x so that $\sqrt[n]{x}$ is:

a) a whole number **b)** a negative integer

c) a rational number **d)** an approximate decimal

Verify your answers.

$\sqrt{\frac{4}{16}} = \frac{2}{4} = \frac{1}{2}$

-0.5

a) $\sqrt{4} = 2$

c) $\sqrt{4} = 2$

b) $\sqrt[3]{-8} = -2$ $(-2) \times (-2) \times (-2)$

Warm-up #3

Sept.22

#1

Estimate the value of $\sqrt[3]{18}$. Please draw a number line and use benchmarks. Show all work.
As well, please show me how you can check to see how close your estimate is.

#2 What are the first 3 perfect squares? Show me how to figure them out.

#3 What are the first 3 perfect cubes? Show me how to figure them out.

#4 Write down any radical and identify the index number and the radicand.

Warm-up #3

Sept.22

#1

Estimate the value of $\sqrt[3]{18}$. Please draw a number line and use benchmarks. Show all work.
As well, please show me how you can check to see how close your estimate is.

#2 What are the first 3 perfect squares? Show me how to figure them out.

$1\times1=1$ $2\times2=4$ $3\times3=9$

$\sqrt{3}$ $2^2=4$

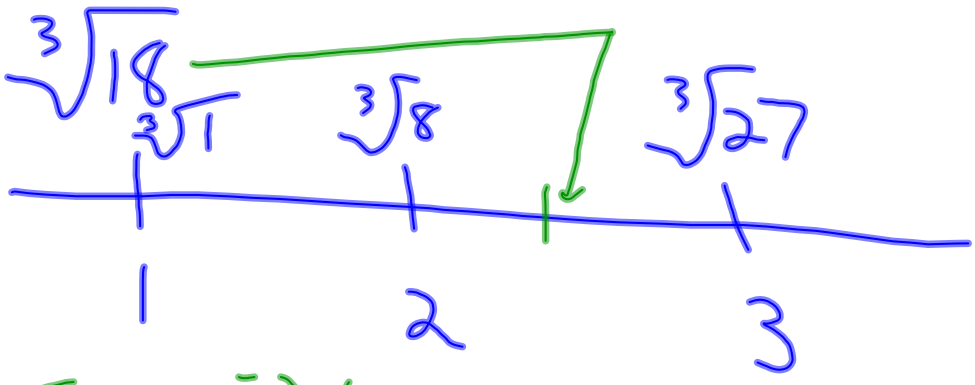
#3 What are the first 3 perfect cubes? Show me how to figure them out.

$1^3=1$ $2^3=8$ $3^3=27$

$\sqrt[3]{}$ $2\times2\times2=$

#4 Write down any radical and identify the index number and the radicand.

$\sqrt{1}$ $\sqrt[3]{16}$ index radicand $\sqrt{10}$



$\sqrt{3}$ $= 2.6$

$2.6 \times 2.6 \times 2.6 = 17.576$